PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2078/PCT	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/GB 03/03411	International filing date *(day/month/year)* 04.08.2003	Priority date *(day/month/year)* 06.08.2002
International Patent Classification (IPC) or both national classification and IPC H05B6/80		
Applicant CAVITY PROTECTION SYSTEMS LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 8 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
07.02.2004	22.07.2004
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Merkt, A Telephone No. +49 89 2399-2935

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB 03/03411

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-6 filed with telefax on 09.06.2004

Claims, Numbers

1-16 filed with telefax on 09.06.2004

Drawings, Sheets

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-16
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-16
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-16
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: US-A-4 778 968 (TORRES MATTHEW A) 18 October 1988 (1988-10-18)
D2: US-A-4 481 395 (PANGBORN GEORGE W ET AL) 6 November 1984 (1984-11-06)
D3: US-A-6 137 097 (HOGAN DAVID ET AL) 24 October 2000 (2000-10-24)
D4: US-A-5 290 985 (JANCIC DALE A ET AL) 1 March 1994 (1994-03-01)
D5: US-A-5 512 737 (MIKLOS JOSEPH P) 30 April 1996 (1996-04-30)
D6: US-A-4 563 559 (ENAMI TOSHIAKI) 7 January 1986 (1986-01-07)

The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (see especially column 3, line 57 to column 4, line 20 and figure 3) a microwave oven liner comprising a roof (16'), a floor (15'), a back (14') and two sides (14'), all being of food grade plastics material and of sufficient (relative term! = unclear) rigidity for automatic washing, the whole being sized to fit removably in a microwave oven.

The subject-matter of claim 1 differs therefrom in that the roof is shorter at the front, which is open, than the floor, to allow air to circulate for steam withdrawal from the oven.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as to improve the air circulation in the oven.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons as these differentiating features are neither known from nor rendered obvious by the available prior art documents.

Claims 2-16 are dependent on claim 1 and as such also meet the requirements of the

PCT with respect to novelty and inventive step.

The industrial applicability of the invention is obvious.

Annotations:

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1-D5 is not mentioned in the description, nor are these documents identified therein.

Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(I) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

OVEN LINER

The present invention relates to an oven liner, in particular a liner for a microwave oven.

In commercial microwave ovens, which are more heavily used than domestic microwave ovens, spits of food can become deposited around the oven, particularly on the inside walls of the oven. Unless these deposits are scrupulously cleaned off at the end of the day, they can build up to the extent that they desiccate and cause arcing and/or other damage. Subsequent repairs can be expensive.

Lightweight, disposable oven liners have been proposed. However, such a liner is of little practical use in a heavily used commercial oven.

The object of the present invention is to provide an improved microwave oven liner.

According to the invention there is provided a microwave oven liner comprising:

- a roof, a floor, a back and two sides,

all being of food grade plastics material and of sufficient rigidity for automatic washing, the whole being sized to fit removably in a microwave oven wherein the roof is shorter at the front, which is open, than the floor, to allow air to circulate for steam withdrawal from the oven.

Normally the roof will be apertured for withdrawal of circulated air.

Preferably, the aperturing of the roof will be a series of holes acting as a coarse filter of spat food.

A particular feature of the preferred embodiment is an upstanding lip across the front of the floor, to retain spilt liquid.

A second preferred feature of the preferred embodiment is a series of ridges on the floor of the liner. Conveniently, the ridges extend from front to back. Preferably they are rounded, typically standing upto 5mm high and usually being 2mm high and being spaced between 5 mm and 20mm apart and usually being 10mm apart. The effect of these ridges is to raise a vessel containing food to be heated off the floor. Thus air is allowed to flow beneath the vessel. This helps to eliminate "hot spots".

It is also preferred that the floor of the liner should be slightly thicker than the sides, back and roof. Facilitates the ridging.

Conveniently, the outside corners between the roof and the other panels and the floor and the other panels are chamfered or rounded to allow ready insertion of the liner into the oven without interference with oven corner seals.

Whilst the liner can be of sheet bent and adhered together, it is preferably an injection moulding. Even when injection moulded, the liner may be of two parts, secured together as by laser welding.

Conveniently the plastics material of the liner is transparent or translucent. The preferred liner is of polypropylene or polycarbonate materials. However, it can be of can be made of any material which is microwave safe, dishwasher safe, food safe and has a high flash point. Preferably the material includes a fire retardant.

The liner is preferably transparent or translucent and it has been found that liners manufactured from clear polycarbonate are ideal.

To help understanding of the invention, a two embodiments thereof will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a conventional microwave oven;

Figure 2 is a similar view of a first liner of the invention sized to fit in the oven;

Figure 3 is a cross-sectional front view showing ribbing of the floor of the oven liner on the plane III-III in Figure 2;

Figure 4 is a view similar to Figure 2 (from the opposite side) of an other oven liner of the invention;

Figure 5 is a cross-sectional view on the plane V-V in Figure 4.

Referring to Figures 1 to 3 of the drawings, a conventional microwave oven 1 has a glass panelled door 2 (shown open) with a cavity 3 lined with steel side and back walls 4, a ceramic floor 5 and a thin plastics moulding roof 6. A gap 7 is provided at the front between the door and the roof, whilst a further aperture 8 is provided in the roof. These are for air circulation by a non-shown fan. A silicon seal 9 seals the floor to the side walls. Non-shown microwave emitters and stirrers are provided above the roof and below the floor.

A liner 11 of the invention is an injection moulding of approximately 5mm thick elements, namely:

a roof 12,

a floor 14,

a back 15 and

two sides 16.

The moulding is of food grade polypropylene, such that the liner can be washed in a commercial dishwasher.

The liner is sized to be a sliding fit in the oven. Due to its modest wall thickness, it reduces the capacity of the oven by a small amount only, yet is sufficiently rigid for washing.

The roof is shorter 17 at the front than the floor to allow air circulation. Further, the roof is apertured, also for air circulation, with a series of small c. 4mm bores 18 registering with the roof aperture 8.

A lip 19 is provided across the front of the floor to retain split liquid.

The external corners 20 are chamfered to clear the silicone seal 9 for instance.

The floor has regularly pitched, 2mm high ridges 21 running front to back. The ridges allow circulation of air beneath a container of food being heated in the oven having the liner.

As seen in Figure 3, the floor is thicker material than the sides. To facilitate moulding, the floor is laser welded 22 to the sides.

Whilst it might have been be expected that the liner would de-grade the cooking performance of the oven, we have surprisingly found that no appreciable loss of performance is experienced when the liner is of 5mm thick, food grade polypropylene.

Turning on to Figures 4 and 5, a second liner 111 of the invention is injection moulded with approximately 5mm thick elements, namely:

a roof 112,
a floor 114,
a back 115 and
two sides 116.

The liner is moulded of food grade polycarbonate, such that the liner can be washed in a commercial dishwasher.

The liner is moulded in two, upper and lower parts 151, 152. In their respective parts, the roof and the floor are essentially planar, with half sides 1161,1162 and half backs 1151,1152 extend at away at a suitable moulding taper. The result is that the lining is widest at mid-height, where the food to be cooked is likely to be widest and that the lining is slightly narrower at the roof and floor level, allowing clearance at the corners of the oven. The external corners 120 are rounded.

The two parts are butted together and laser welded 122. The actual process of welding forms no part of the invention as such.

As with the first embodiment, the roof is shorter 117 at the front than the floor to allow air circulation. Further, the roof is apertured, also for air circulation, with a series of small c. 10mm bores 118 registering with the roof aperture of the oven.

A lip 119 is provided across the front of the floor to retain split liquid.

The floor has 2mm high, regularly pitched, radial ridges 121. The ridges allow circulation of air beneath a container of food being heated in the oven having the liner. A further square-in-plan ridge 1211 extends around the distal ends of the radial ridges as a further split food retainer.

To ease cleaning and enhance appearance, the surfaces of the liners are provided with a mirror finish, by moulding in a highly polished mould tool.

The above-described liners have the following advantages:

The microwave oven liners provide a cleaner and more effective use of a microwave oven. There are a number of practical advantages when a liner is used and these include.

1. The liner is easily removable and is dishwasher safe thereby providing quick and simple cleaning of the microwave oven. Use of the liner, particularly in a commercial dishwasher, avoids the lengthy manual cleaning of the cavity in a microwave oven.
2. If spillage of liquids occurs in the oven, the liner will prevent damage to the base – frequently of ceramic material – and the base seals of the microwave oven, the base being an expensive item to replace.
3. Use of the liner in a microwave oven prevents food contamination of the stirrer cover caused by spitting during the cooking of food.
4. The stirrer assemblies in the base, the roof, wave guide and the magnetrons are also protected from possible damage caused by the lack of cleaning the cavity and associated equipment in the microwave oven.
5. The use of the liner prevents arcing across residual food particles which are frequently missed under normal manual cleaning procedures.
6. The lens cover in a microwave oven is protected when a liner according to the invention is used. It is not unusual for steam from food to cause the lens lamp cover to become detached. This allows steam to exit the cavity onto the lamp holder. This can cause electrical arcing and burning of the lamp connector

and wiring. Frequently grease can pass this way causing damage to other electrical components such as PC boards.

7. The lost time or "down time" of a microwave oven during busy periods is avoided while awaiting repairs.

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CLAIMS:

1. A microwave oven liner comprising:

- a roof, a floor, a back and two sides ("the floor and the other panels"),

all being of food grade plastics material and of sufficient rigidity for automatic washing, the whole being sized to fit removably in a microwave oven and wherein the roof is shorter at the front, which is open, than the floor, to allow air to circulate for steam withdrawal from the oven

2. A microwave oven liner as claimed in claim 1, wherein the roof is apertured for withdrawal of circulated air.

3. A microwave oven liner as claimed in claim 2, wherein the aperturing of the roof is a series of holes acting as a coarse filter of spat food.

4. A microwave oven liner as claimed in any preceding claim, including an upstanding lip across the front of the floor, to retain spilt liquid.

5. A microwave oven liner as claimed in any preceding claim, including a series of ridges on the floor of the liner.

6. A microwave oven liner as claimed in claim 5, wherein the ridges stand up to 5mm high.

7. A microwave oven liner as claimed in any preceding claim, wherein the ridges stand 2mm high.

8. A microwave oven liner as claimed in any preceding claim, wherein outside corners between the roof and other panels and the floor and other panels are chamfered or rounded to allow ready insertion of the liner into the oven without interference with oven corner seals.

9. A microwave oven liner as claimed in any preceding claim, wherein the liner is of sheet bent and adhered together.

10. A microwave oven liner as claimed in any preceding claim, wherein the liner is injection moulded.

11. A microwave oven liner as claimed in any preceding claim, wherein the liner is of two or more two parts, welded together.

12. A microwave oven liner as claimed in claim 11, wherein the two parts are joined at mid-height, the back and sides tapering inwards to the floor and the roof from the joint.

13. A microwave oven liner as claimed in any preceding claim, wherein the liner has a mirror finish.

14. A microwave oven liner as claimed in claim 13, wherein the liner is transparent.

15. A microwave oven liner as claimed in any preceding claim, wherein the liner is of polycarbonate or polypropylene material.

16. A microwave oven liner as claimed in claim 15, wherein the material includes a fire retardant.